SUBSURFACE CONTAMINANT AND HYDROGEOLOGIC INVESTIGATION SUMMARY REPORT FOR THE EDGEWATER MARKET ST. ALBANS BAY, VERMONT

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I. <u>INTRODUCTION</u>

The following report provides a chronological history and data summary of the contaminant investigation and sequence of events leading up to the proposed gasoline contamination remediation system at the Edgewater Market site in St. Albans Bay, Vermont.

II. BACKGROUND SITE HISTORY

On April 1, 1991, three existing 3,000 gallon gasoline underground storage tanks (UST's) were excavated, purged, and removed from the Edgewater Market site by S. B. Collins, Inc. (SBC). Carl Ruprecht of SBC supervised the tank removal and screened soils from the excavation with an HNU photoionization detector (PID). The three tanks were described by Carl Ruprecht as in "average condition, minor pitting, no perforation". A description of the associated tank piping system was not given. Soils screened with the PID revealed petroleum vapor contamination levels ranging from 50 to 75 ppm around the three fill pipes, and the greatest contamination levels were below the western most tank at 150 ppm. Ground water was encountered at 8.5' and bedrock at 9.5' depth. Soils in the tank excavation were described as "distinctly layered silt and sand", and native soils surrounding the tank areas was "stiff clay". Vapor levels of 30 to 40 ppm were detected at the ground water level, although no free phase petroleum product was observed. Approximately 20 cubic yards of contaminated soil was removed and transported to SBC for on-site treatment by polyencapsulation. The details of the underground storage tank (UST) removal were included in an April 3, 1991 letter from Carl Ruprecht to Marc Coleman of the Vermont Department of Environmental Conservation (VDEC) Sites Management Section (SMS).

A VDEC inspector visited the site on April 9, 1991 and measured free gasoline product (2" and 1/8") in two ground water monitoring wells that had previously been installed on-site in 1990 as part of an early leak detection system. Since free gasoline product was discovered atop ground water and located approximately 60 yards from St. Albans Bay, William Ahearn, Director of the VDEC Hazardous Materials Management Division (HMMD) sent a certified letter to SBC on April 16, 1991 ordering them to retain the services of a qualified consultant within ten days in order to conduct a hydrogeological investigation of the subsurface gasoline contamination and design and implement a remediation system capable of recovering all free product in excess of 0.01'. In addition, SBC was ordered to properly maintain the encapsulation surrounding the stockpiled soils on their property, and then properly dispose of the soils.

In a letter on April 19, 1991 to William Ahearn, Carl Ruprecht requested a 30 day extension to the 10 day deadline for hiring a qualified consultant in order that SBC could continue manual bailing of free product from the six monitoring wells beside the excavation, install three additional downgradient monitoring wells, and prepare and submit a report on the findings and results.

Almost a month later on May 16, 1991 William Ahearn replied to SBC via certified mail stating that the Edgewater Market site required work involving the expertise of a qualified consultant, and therefore HMMD would not support delaying the hiring of a consultant for 30 days.

Carl Ruprecht notified William Ahearn by letter on May 22, 1991 that he would be meeting with a representative of Lincoln Applied Geology, Inc. (LAG) on May 28, 1991 to formulate a remediation plan for the Edgewater Market site. All of the above mentioned letter correspondence is included as **Appendix A**.

On June 4, 1991 Steve Revell of LAG sent a memorandum to Carl Ruprecht outlining the requirements for a hydrogeological investigation of the gasoline contamination in the vicinity of the site. LAG proposed installing up to five, ten foot deep ground water monitoring wells both on and off the site. Wells would be placed as follows: one well upgradient of the tank area behind the Edgewater Market building; two wells downgradient of the tank area near the storm sewer catch basin; and two wells downgradient across Hathaway Point Road (Route 36) between the tank area and St. Albans Bay. All wells would be developed, sampled, and analyzed for the presence of BTEX and MTBE. In addition, a sensitive receptor analysis would be conducted and the characteristics of the soil and ground water defined.

Background research regarding potential environmental contaminant receptors indicated that residences and businesses in the Town of St. Albans Bay obtain drinking water from drilled bedrock wells located on each property. Wells are drilled to several hundred feet into bedrock, and residents describe the water obtained as "sulfur water" due to its hydrogen sulfide odor. Fractured black shale bedrock lies at a depth of approximately ten feet in the area of the site. Surface waters of St. Albans Bay, part of Lake Champlain, lie 150 feet southwest of the on-site tank area.

III. SITE LOCATION

Edgewater Market is a small grocery store and self-serve Getty gasoline station owned by SBC and leased and operated by Brian Boudreau. It is located on State Route 36 on the north side of the intersection of West Street and Hathaway Point Road in the Town of St. Albans Bay, Vermont. The property is located on the General Site Location Map presented as **Figure 1**.

The Detailed Site Map showing pertinent buildings and subsurface structures is included as **Figure 2**.

Topographically the Edgewater Market site lies at an elevation of 107 to 110 feet above mean sea level (MSL). The majority of the Edgewater Market site is paved with asphalt and occupied by a single story building and gasoline pump island. Behind the building to the north is an unpaved, open, grassy lawn. The site slopes gently toward St. Albans Town Park to the southwest which then slopes steeply down a cut rock rip-rap wall to surface waters of St. Albans Bay. The topographic relief from the site to St. Albans Bay is approximately 13 to 15 feet and the distance is approximately 150 feet. Residential homes and apartments abut the site to the northeast, north, and northwest. West and southwest of the site is St. Albans Town Park, beyond which is St. Albans Bay. Loli of Vermont, a manufacturer of clothing, is located approximately 70 feet south of the site, and Bayside Pavilion, a nightclub and restaurant, lies approximately 60 feet southeast of the site. Both are located across Route 36. Southeast of the Bayside Pavilion and Loli of Vermont properties are additional residential homes.

Precipitation falling onto the site will follow three different paths. In the eastern part of the site precipitation will flow overland toward the south to a storm sewer grate located on the north side of Route 36. On the western part of the site precipitation will flow overland to the southwest and infiltrate the unpaved area of the St. Albans Town Park. To the north precipitation directly infiltrates the unpaved lawn.

IV. SUBSURFACE GEOLOGY

Geologic deposits present beneath the Edgewater Market site and the St. Albans Town Park property include three types: (1) assorted fill materials consisting of cut stone and boulder foundation blocks, brick, cinders, ashes, sand, and gravel that overlie (2) native unconsolidated surficial sedimentary deposits that are in turn underlain by (3) consolidated meta-sedimentary bedrock of the St. Albans Synclinorium. The surficial geology of the area was mapped by D.P. Stewart and compiled by C.G. Doll for publication in 1970 as the "Surficial Geologic Map of Vermont". At the site and St. Albans Town Park property, surficial geologic deposits are described as marine clay.

Bedrock geology in the area was mapped by M. Kay in 1958 and 1960, edited by W.M. Cady, and compiled and edited by C.G. Doll, W.M. Cady, J.B. Thompson, Jr., and M.P. Billings for publication in 1961 as the "Centennial Geologic Map of Vermont". The site is located east of the Highgate Springs Thrust and west of the Champlain Thrust in a sequence of Ordovician age metasedimentary bedrock consisting largely of limestone, marbles, dolomite,

shale, and phyllite. Bedrock encountered in subsurface borings at the site and on St. Albans Town Park property include both the Hortonville or Cumberland Head, and Glens Falls formations, undifferentiated, as well as the Orwell limestone, and Isle La Motte and Lowville limestones. The Hortonville formation is described as: "black, carbonaceous, and pyritic slate and phyllite, locally sandy; brown weathered limy beds are common near base", and the Orwell limestone as "smooth ledged, sublithographic and lithographic, dove-gray weathered limestone commonly cut by veins of white calcite." No outcrops of bedrock are present on-site. Bedrock samples from the site closely resemble the Hortonville formation and the Orwell limestone.

V. <u>SCOPE OF INVESTIGATION</u>

A. Objectives

The objectives of LAG's subsurface contaminant investigation were to:

- define and remove the source/sources of petroleum contamination,
- 2. define the degree, phase, and areal extent of petroleum contamination,
- 3. define ground water and contaminant flow direction and gradients,
- design, install, and operate a ground water remediation system which would effectively contain and recover the petroleum contamination, and
- 5. minimize the potential for consumption of petroleum contaminated drinking water from nearby private wells by the residents of the St. Albans Bay community.

B. <u>Methodology Utilized to Accomplish Objectives</u>

The definition of the degree, phase, areal extent of subsurface contamination, flow directions and gradients has involved:

- 1. the application of reconnaissance level field mapping techniques to define the surficial and bedrock geology of the site,
- 2. the installation of eleven 2" diameter ground water quality monitoring wells in addition to three monitoring wells and two tank

- wells already installed on-site. Three wells would be installed on the site and eight wells on St. Albans Town Park property,
- the installation of one 6" diameter ground water recovery well for active pumping and ground water depression,
- 4. the descriptive logging and HNU photoionization detector (PID)/olfactory screening of all soils associated with ground water monitoring well installation,
- 5. the performance of a stadia type site survey and the generation of a scaled site map,
- 6. the collection of HNU PID, ground water level, and product thickness data,
- the generation of ground water contour maps,
- 8. the collection and analysis of chemical ground water quality samples, and
- the compilation, detailed review, and evaluation of all data collected to date.

At present, a ground water remediation system has not been installed. However, one is proposed to be installed in the near future.

VI. <u>RESULTS OF INVESTIGATION</u>

On July 23, 1991, Bill Norland of LAG met with Carl Ruprecht of SBC on-site to initiate the installation of additional 2" ground water quality monitoring wells. Three 2" monitoring wells (MW-4, MW-5, and MW-6) and two tank wells (TW-1 and TW-2) have previously been installed on-site. SBC utilized a backhoe-mounted CHAMA hydraulic drilling apparatus and 4.25" hollow stem augers to drill through the fill materials and unconsolidated surficial sediments.

The first monitoring well installed was MW-7 and is located upgradient of the tank area on the site north of and behind the Edgewater Market building. Two other wells (MW-8 and MW-9) were located south of the building and downgradient of the tank area on-site. Detailed LAG soil logs are presented as **Appendix B**.

Unconsolidated surficial geologic deposits encountered at the site consist of assorted fill materials such as crushed stone, silt, sand, and gravel

from beneath the asphalt pavement in MW-8 and MW-9 to a depth of approximately 3.5 feet. This was underlain by silt, fine to coarse sand, and lesser quantities of gravel to the top of bedrock at 7.25 feet in MW-9 and 9.5 feet in MW-7. Bedrock was not encountered in MW-8, although a coarser layer of fine to coarse sand was present from 7.5 feet to 9.5 feet. Soil samples were obtained by forcing a 2" diameter, two foot long spilt-barrel sampler into the soil ahead of the hollow stem augers. Soil samples were then screened for the presence of petroleum hydrocarbons by using both the HNU PID and olfactory senses. An oil odor and elevated PID levels were detected in MW-7 at a depth of 3.5 feet (9.8 ppm) and MW-8 at a depth of 7.5 to 9.5 feet (11.4 ppm). Two-inch diameter schedule 40 PVC ground water monitoring wells were then installed in MW-7, MW-8, and MW-9 such that the top of the screen was a minimum of three feet above the ground water surface. Well construction details are included with the LAG boring logs in **Appendix B**.

On the following day, July 24, 1991, several attempts were made to install two additional ground water monitoring wells on St. Albans Town Park property downgradient of the pump island. These attempts were unsuccessful due to the CHAMA drilling apparatus encountering boulders or cut stone blocks at depths ranging from 2.5 feet to 5 feet. Unlike a standard drilling rig, the CHAMA apparatus has limited weight and only hydraulic fluid pressure to turn the augers through some subsurface obstructions. Therefore, when a subsurface obstruction is encountered either the monitoring well must be placed at that depth attained or the boring must be abandoned and backfilled. It was later decided by SBC that due to the nature of the subsurface materials being drilled, additional ground water monitoring wells were better installed by excavating test pits.

Four test pits were excavated and four ground water monitoring wells were installed on St. Albans Town Park property on August 1, 1991. SBC used a backhoe to excavate a three foot wide by eleven foot long test pit from the ground surface to bedrock refusal at depths ranging from 8.75 to 10 feet. Unconsolidated surficial geologic deposits encountered at the Town Park property consisted of assorted fill materials of sand, gravel, ashes, cinders, brick, plaster, cut stone, and boulders from the ground surface to 4.5 feet in MW-11 (TP-2), MW-12 (TP-3), and MW-13 (TP-4), and to 5 feet in MW-10 (TP-1). These were underlain by native sedimentary deposits of fine sand with some silt and coarse gravel to the top of the fractured shale bedrock in all test pits except MW-13 (TP-4), where a coarse layer of fine to coarse sand with some fine to coarse gravel was present from 6.75 feet to the top of shale bedrock at 9.5 feet.

Elevated PID vapor levels and strong gasoline odors were detected in three of the four test pits. Concentrations ranged from 84 to 154 ppm in



MW-10 (TP-1) at a depth of 6 to 9 feet; 70 to 168 ppm in MW-11 (TP-2) at 7.25 to 8.75 feet; and 118 to 194 ppm in MW-13 (TP-4) at 6 to 9.5 feet; MW-12 (TP-3) was "clean" with background (BG) vapor levels. Free gasoline product atop ground water was present in MW-10 (TP-1) and MW-13 (TP-4), and a gasoline sheen was present in MW-11 (TP-2).

Two-inch ground water monitoring wells were installed in all four test pits. Construction details and logs of the wells are presented in **Appendix B**. Several inches of free gasoline product was discovered by SBC in MW-13 on August 5th, and ground water samples from wells MW-7, MW-5, and MW-8 were collected following proper well purging on August 6, 1991. At that time, free product was detected in MW-4, MW-6, and MW-13. Four wells (MW-9, MW-10, MW-11, and MW-12) were dry. An HNU PID survey of the ten wells on the same day revealed elevated vapor levels in six wells. Saturated lamp (SL) vapor levels were detected in MW-4, MW-5, MW-6, and MW-8, while MW-13 and MW-9 had 22 ppm and 60 ppm, respectively. Ground water quality results reveal that MW-5 was the most contaminated with 48,790 ppb BTEX and 3,830 ppb MTBE. MW-7 had 6.78 ppb toluene, and MW-8 had 145.2 ppb BTEX and 133 ppb MTBE. Ground water quality laboratory results are presented in **Appendix C**.

On August 8, 1991 Chuck Schwer of VDEC was notified by telephone that free gasoline product greater than 0.21 feet in thickness was measured in MW-13 approximately 75 feet east of St. Albans Bay. He immediately requested an on-site meeting with Carl Ruprecht of SBC and Steve Revell of LAG on the following day to discuss the findings to date and determine a proper course of action for continued investigation of the extent of free, dissolved, and vapor phase gasoline contamination, and the ultimate remediation of the problem.

A summary letter of findings from the test pit excavations and their respective ground water monitoring wells was prepared by LAG on August 9, 1991. At the on-site meeting, Chuck Schwer, Carl Ruprecht, and Steve Revell agreed that additional 2 inch diameter ground water monitoring wells penetrating a minimum of ten feet into bedrock, as well as a six inch diameter ground water recovery well for pumping and maintaining active ground water depression should be installed on the St. Albans Town Park property. Soon thereafter a ground water pumping, recovery, treatment, and discharge system would be installed on Park property to begin active ground water remediation efforts. A Health and Safety Plan for the site was then developed and put into effect on August 11, 1991.

On August 12, 1991, LAG submitted a proposed work plan to Chuck Schwer (VDEC) and Carl Ruprecht (SBC). In the proposed work plan, the investigation and findings to date were summarized. Results of the

investigation indicated that free phase gasoline product had migrated across Route 36 toward St. Albans Bay. Evidence of gasoline vapors had been found in MW-10 (TP-1), MW-11 (TP-2), and MW-13 (TP-4). The results of the ground water monitoring to date indicated that free product and dissolved contaminants were actively migrating on top and possibly within the bedrock aquifer on their way to a point or zone of discharge into St. Albans Bay. The proposed work plan included a need for additional investigation to accurately determine: (1) the limits of free and dissolved contamination, (2) the relationship between the contamination and both the surficial and bedrock aquifer, (3) the impact of contaminants on the bedrock aquifer, (4) the impact of contaminants on public receptors, (5) the impact of contaminants on environmental receptors, (6) historical site perspectives associated with additional contaminant sources, preferred avenues of contaminant migration, land use, water supplies, and (7) the best possible means of expeditiously remediating the problem and minimizing the impacts to both public and environmental receptors.

The proposed work plan would be conducted in a phased manner. The phases, in order of conductance would include: (1) the placement of at least four additional test pits in order to determine the general presence and extent of contamination so that additional monitoring wells could be accurately placed, (2) the conductance of a water supply well location survey in the area surrounding the Edgewater Market to locate both unconsolidated and bedrock wells, (3) the conductance of a historical perspectives survey, (4) the determination of the relationship between the St. Albans Bay lake level and ground water levels in existing monitoring wells, (5) the determination of absolute locations for the proposed two inch monitoring wells, (6) the installation of the proposed two inch ground water monitoring wells to a completion depth of 30 feet with 25 feet of well screen (7) the determination of an absolute location for the proposed six inch monitoring and pumping recovery well which could be used for free product and dissolved contaminant interception purposes, (8) the construction of the proposed six inch diameter recovery well to a completion depth of 30 feet with 26 feet of galvanized steel wound well screen, (9) the development of all new wells using non-turbulent methods, (10) the monitoring of all wells on-site and the construction of an accurate water table contour map, (11) the collection of water samples from monitoring wells without free product and from water supplies adjacent to the site, (12) the design and installation of a ground water remediation system to intercept and prevent contaminants from impacting both public and environmental receptors, (13) the compilation of an accurate expanded site map showing all buildings, wells, and other information important to the determination of contaminant impacts, the remediation of areas currently impacted by contaminants, and the prevention of contaminant impacts to uncontaminated areas and aquifers, and (14) the compilation of all information

into a summary report which defines site conditions, contaminant status, receptors, adequacy of the monitoring network, and adequacy of the installed remediation system. The proposed work plan was authorized by both Chuck Schwer (VDEC) and Carl Ruprecht (SBC).

Four additional test pits (TP-5, TP-6, TP-7, and TP-8) were excavated on St. Albans Town Park property by SBC on August 12, 1991. No ground water monitoring wells were installed in these test pits. Unconsolidated surficial geologic deposits encountered consisted of assorted fill materials of sand, gravel, brick, cinders, boulders, and cut and crushed stone from the ground surface to a depth of 4.5 feet in TP-5, TP-6, and TP-7, and to 5 feet in TP-8. These were underlain by native deposits of silt and fine sand with little fine to coarse gravel in TP-5 and TP-6, and fine sand with some silt and fine to coarse gravel in TP-7 and TP-8. The top of the fractured shale bedrock was at 8 feet in TP-8, 9 feet in TP-5 and TP-6, and 9.5 feet in TP-7.

Elevated PID vapor levels and slight to strong gasoline odors were detected in three of the four test pits. Concentrations varied from 168 ppm at a depth of 8 to 9 feet in TP-5; 164 ppm at 9.5 to 10 feet in TP-7; and 142 ppm at 8 to 8.25 feet in TP-8. TP-6 was "clean" with BG vapor levels. Ground water was encountered only in TP-6 and TP-7 at 8.8 feet and 9.8 feet, respectively. A gasoline sheen was observed atop ground water in TP-7. Test pit logs are included in **Appendix B**.

A water supply well location survey was conducted in the area of Edgewater Market on August 12, 1991. Permission was given to sample private drinking water wells from Edgewater Market, Bayside Pavilion, Loli of Vermont, Mr. Oulette, and Mr. King. All businesses, residential homes, and apartments obtain drinking water from drilled bedrock wells, and the water is described as "sulfur water" due to the presence of hydrogen sulfide. Water quality samples were collected from these water wells on August 26, 1991 in addition to the Mr. Rushford and Mr. Taft wells. The water quality results are forthcoming from the analytical laboratory. The well serving the apartment building to the northeast of Edgewater Market was sampled on September 3, 1991. Mr. Hamil's well will be sampled during the week of September 16, 1991. Locations of nearby private drinking water wells are shown on the Water Well Map Location Map presented as Figure 3.

Four additional 2 inch diameter ground water monitoring wells and one 6 inch diameter ground water recovery well were installed on August 14, 1991. Three wells (MW-14, MW-15, and MW-16) and the only recovery well (RW-1) were installed on St. Albans Town Park property, and one well (MW-17) was installed a short distance off the north corner of the Loli of Vermont building.

Chevalier Drilling used an air-rotary drilling rig to penetrate the unconsolidated surficial materials and fractured shale bedrock. MW-14, MW-15, and MW-16 were drilled to a depth of 30 feet and encountered pebbly medium sands (0' - 12'), bricks and fill materials (0' -12') and medium sands (0' - 5'), respectively. Beneath these deposits fractured shale bedrock was present all the way to the bottom of the boring. In each of the three borings was installed a two inch diameter ground water monitoring well constructed of five feet of solid riser and 25 feet of well screen. MW-17, located closer to the Loli of Vermont private drinking water well than the other monitoring wells, was completed at a shallower depth (23 feet) so as to minimize the possibility of drilling-related impacts to the water quality of the drinking water well. Sands and fill materials were encountered from the surface to a depth of 13 feet, and fractured shale bedrock from 13 feet to the bottom of the boring at 23 feet. The monitoring well was constructed of five feet of solid riser and 18 feet of well screen. Only MW-14 had a strong gasoline odor, at a depth of 10 feet. Recovery well RW-1 was drilled to a depth of 37 feet, encountering sands with some quartzite boulders from the surface to a depth of 8.5 feet, beneath which was fractured shale bedrock to the bottom of the boring. A six inch diameter recovery well constructed of 6.5 feet of solid steel riser welded atop 30.5 feet of continuous wound galvanized steel well screen was then installed in the boring. Well logs and construction details are presented in Appendix B.

A stadia survey of the Edgewater Market and St. Albans Town Park was conducted on August 19, 1991 that included the locations of all wells, test pits, buildings, roadways, utility poles, the USGS 109' benchmark at the north corner of the Loli of Vermont building, and the elevations of all tops of casings (TOCs). Wells MW-15, MW-16, MW-17, and RW-1 were purged using non-turbulent methods in preparation for upcoming ground water sampling. MW-14 was not purged because 0.65 feet of free gasoline product was measured in the well.

A ground water elevation monitoring round was conducted on all wells on-site on August 19, 1991. Ground water elevations and product thickness data are presented as **Table 1**. Free gasoline product was measured in MW-4 (0.03 feet), MW-6 (0.06 feet and no water present), MW-14 (0.65 feet), MW-15 (0.01 feet), and RW-1 (0.01 feet). MW-10, MW-11, MW-12, and MW-13 were dry, as well as TW-1 and TW-2. Ground water elevation data was used to construct the ground water contour map presented as **Figure 4**. The ground water gradient from MW-9 to MW-14 is 0.052 ft/ft, and the dominant ground water flow direction is from the Edgewater Market area toward the south-southwest across Route 36 to St. Albans Town Park property. A narrow ground water trough extending in a linear direction from MW-14 to MW-11 to MW-15 causes a shift in ground water flow direction to the west and west-southwest toward St. Albans Bay.

A ground water monitoring survey was conducted on August 26, 1991. Ground water elevation and product thickness data are presented in **Table 1**, and HNU PID data are presented as **Table 2**. Elevated PID vapor levels were detected in 10 of the 17 wells. The greatest vapor levels were saturated lamp (SL) from MW-5, MW-8, and MW-14. MW-4, MW-6, MW-10, and MW-13 all had PID readings of 90 ppm, TW-2 had 50 ppm, and TW-1 and RW-1 each had 20 ppm. Free gasoline product was measured in MW-4 (0.02 feet), MW-6 (0.01 feet and no water), and MW-14 (0.10 feet), and has decreased in thickness since August 19th and disappeared completely from MW-15 and RW-1. Ground water levels declined in all wells with water except MW-14, MW-17, and RW-1. MW-14 increased slightly, probably in response to a marked decrease of 0.55 feet in free product thickness since August 19th. Six wells remained dry (MW-10, MW-11, MW-12, MW-13, TW-1, and TW-2).

A ground water contour map was developed from ground water elevation data collected on August 26, 1991 and is presented as **Figure 5**. The ground water gradient from MW-9 to MW-16 is 0.056 ft/ft, almost identical to the ground water gradient from August 19th. The ground water flow direction is from the Edgewater Market site toward the south-southeast and into a shallow, narrow ground water trough that extends in a linear direction from MW-17 to MW-14 to MW-16. The ground water flow direction then changes in the trough, flowing toward the northwest and then probably westward to St. Albans Bay. Lack of ground water elevation data from MW-15 and the St. Albans Bay lake level prevents accurate determination of ground water flow towards the Bay.

On September 3, 1991, a complete ground water monitoring survey was conducted. Ground water elevation and product thickness data are presented in **Table 1**, and HNU PID Data are presented as **Table 2**. Elevated PID vapor levels were detected in nine of the seventeen wells on-site. The greatest vapor levels (SL) were detected in MW-6, MW-8, MW-14, TW-1, and TW-2. Other elevated levels were from MW-4 (100 ppm), MW-13 (70 ppm), MW-5 (60 ppm), and RW-1 (52 ppm). The remaining wells had low levels of 10 ppm (MW-9, MW-10), 1.0 ppm (MW-7), 0.2 ppm (MW-17) and BG levels in MW-11, MW-12, MW-15, and MW-16. Free gasoline product was measured in MW-4 (0.10 feet), MW-5 (0.02 feet), MW-6 (0.10 feet), and MW-13 (0.03 feet). These product thicknesses represent increases since August 26th, the detection of free product for the first time in MW-5, and the disappearance of product from MW-14.

A ground water contour map was developed from ground water elevation data collected on September 3, 1991 and is presented as **Figure 6**. The ground water gradient from MW-4 to MW-15 is 0.033 ft/ft having decreased 0.023 ft/ft since August 26, 1991. The ground water flow direction is from the Edgewater Market site toward the southwest and St. Albans Bay. This is

probably a more accurate and realistic representation of the ground water flow conditions beneath the site and St. Albans Town Park property because an accurate lake level elevation of St. Albans Bay was obtained, and the ground water troughs present in the two previous ground water contour maps have disappeared.

VII. CONCLUSIONS

In light of all data collected to date at the Edgewater Market site in St. Albans Bay, Vermont, the following conclusions are presented.

- Three 3,000 gallon gasoline underground storage tanks (UST's) owned by SBC were removed from the Edgewater Market site on April 1, 1991.
- The tanks were all in average condition with minor pitting but no perforations. No mention of the condition of the delivery pipeline system was made by SBC in the tank pull report.
- 3. HNU PID readings showed vapor contamination levels of 50 to 75 ppm around the three fill pipes, and the greatest contamination levels of up to 150 ppm below the western most tank.
- 4. Dark soils and vapor levels of 30 to 40 ppm were detected at the ground water level, but no free phase petroleum product was detected during the excavation.
- 5. Approximately 20 cubic yards of contaminated soil was removed from the tank excavation and transported to SBC for on-site treatment by polyencapsulation. Two new gasoline UST's were installed to replace the three older tanks excavated.
- 6. On April 9, 1991, a VDEC inspector measured 2 inches and 1/8 inch of free phase gasoline product in two ground water monitoring wells in the tank area, only 60 yards from St. Albans Bay surface waters.
- 7. William Ahearn of the VDEC ordered SBC on April 16, 1991 to obtain the services of a qualified consultant within 10 days to conduct a hydrogeological investigation and design and implement a remediation system capable of recovering free product.

- 8. Carl Ruprecht of SBC requested a 30-day extension to the 10-day deadline on April 19, 1991, so that SBC could continue manual product recovery efforts, install additional downgradient wells, and prepare a report on the findings.
- 9. William Ahearn of the VDEC denied the extension request on May 16, 1991.
- SBC met with LAG on-site on May 28, 1991 to formulate a remediation plan, which was approved and accepted by SBC and VDEC.
- 11. Free phase gasoline exists on the ground water surface beneath the site and St. Albans Town Park property in MW-4, MW-5, MW-6, and MW-13 in thicknesses of up to 0.21 feet. However, the product thicknesses have been continually fluctuating. Some wells which once had free product no longer do.
- 12. St. Albans Bay lies 150 feet southwest of the site and represents the ultimate discharge zone of the ground water system beneath the site.
- 13. Private drilled bedrock water wells supply the areas businesses, residential homes, and apartments with drinking water. The closest well is the Edgewater Market well located approximately 25 feet northeast of the pump island. Other private wells are located at greater distances from the pump island.
- 14. Private drinking water wells have been sampled for the presence of BTEX and MTBE and the results of the analysis have not yet been received from the analytical laboratory.
- 15. The soils encountered beneath the site and St. Albans Town Park property consist of a layer of assorted fill materials above fine sand and silt deposits, which are in turn underlain by fractured shale bedrock at depths ranging from 7 to 12 feet.
- 16. A coarse deposit of fine to coarse sand; some silt; trace of fine to coarse gravel and clay exists in MW-8 at a depth of 7.5 to 9.5 feet; and another coarse deposit of fine to coarse sand, some fine to coarse gravel; little silt exists in MW-13 at a depth of 6.25 to 9.5 feet. Both coarse deposits may be hydraulically connected and represent an old drainage channel formed during the waning stages of glaciation. Free gasoline product has been observed in

- both MW-8 and MW-13, and these coarse deposits may be a preferred avenue for contaminant migration from the tank area toward St. Albans Bay.
- 17. Ground water flows from the Edgewater Market area southwest toward St. Albans Bay after passing beneath the St. Albans Town Park. The presence of several monitoring wells installed by unconventional drilling methods resulted in placement of the wellpoints above the ground water table and being almost continually dry and of no use for the development of ground water contour maps.
- Quantifiable amounts of dissolved gasoline associated contamination are present in ground water monitoring wells installed on the Edgewater Market site.
- 19. The 6 inch diameter ground water recovery well (RW-1) on St. Albans Town Park property where free phase gasoline product thicknesses have been the greatest should allow active ground water depression, ground water treatment, and the recovery of free gasoline product when a submersible ground water pump, treatment system, and product recovery system is installed.

VII. <u>RECOMMENDATIONS</u>

Based on the findings to date and the presented conclusions, the following recommendations are set forth for review.

- Continue the current level of ground water elevation, HNU PID, and chemical ground water quality data collection.
- Install a submersible ground water pump in RW-1 that would be capable of pumping up to 10 gallons per minute (gpm) and maintain active ground water depression.
- Install a ground water recovery treatment and discharge system near RW-1 consisting of two 55-gallon carbon canister drums connected in series that would treat the gasoline contaminated ground water with granular activated carbon (GAC) prior to discharging the treated water to the storm sewer pipeline near RW-1. Treated water would then flow from the storm sewer into St. Albans Bay. A surface discharge permit would be required by VDEC.

- Install a product recovery system that would actively recover free phase gasoline product in thicknesses of 0.01 foot or greater from atop the ground water in RW-1.
- 5. Operate and maintain both the ground water depression, recovery, treatment, and discharge system; and the product recovery system on a continual basis.
- Collect ground water treatment system samples on a biweekly basis for chemical analysis of BTEX and MTBE to ensure that GAC canisters are changed prior to contaminant breakthrough.

Project:

Edgewater Market

Job#

9076

Location:

St. Albans, Vermont

Sheet #

of 1

Ground Water Elevation/Product Thickness Data (feet)

Data	August									September	· <u>-</u> .		
Point	TOC	8-6-91		8-12-91		8-19-91		8-26-91		9-3-91			
MW-4	107.48	99.13	0.05	99.13	0.03	98.94	0.03	98.79	0.02	98.63	0.10		
MW-5	106.73	97.88		98.87		98.67		99,46		98.41	0.02		
MW-6	107.59	99.49	0.05	99.39	0.10	No Water	0.06	No Water	0.01	99.39	0.10		
MW-7	110.06	101.44		101.31		101.09		100.93		100.85			·
MW-8	107.31	98.99		98.96		98.80		98.69		98.61			
MW-9	106.81	Dry		100.31		100.32		100.31		Dry			
MW-10	106.71	Dry		97.76		Dry		Dry		Dry			
MW-11	104.52	Dry		95.97		Dry		Dry		Dry			
MW-12	106.33	Dry		Dry		Dry		Dry		Dry			
MW-13	105.83	No Water	0.21	96.63	0.13	Dry		Dry		96.63	0.03		
MW-14	106.26					95.44	0.65	96.72	0.10	96.81			
MW-15	102.47					94.87	0.01			94.72			
MW-16	105.81					96.84		96.69		96.64			
MW-17	106.76					96.45		96.51		96.66			
TW-1	107.87		<u>-</u>	:		Dry		Dry		Dry			
TW-2	108.45					Dry		Dry		Dry			
LP-1	98.68									94.10			
RW-1	105.80					96.94	0.01	97.71		96.85			

of

Project:

Edgewater Market

Job#

9076

Location:

St. Albans Bay, Vermont

Sheet #

1

HNU Photoionization Readings (PID) (ppm)								
Data Point	8-6-91	August 8-12-91	8-26-91	9-3-91	September			
MW-4	SL	38	90	100				
MW-5	SL	SL	SL	60				
MW-6	SL	SL	90	SL				
MW-7	5.6	2.0	0.6	1.0				
MW-8	SL	3.0	SL	SL				
MW-9	60	7.4	1.4	10.0				
MW-10	8.0	4.8	90	10.0				
MW-11	BG	0.2	1.0	ВG				
MW-12	1.0	0.4	BG	BG				
MW-13	22	2.0	90	70				
MW-14			SL	SL				
MW-15				BG				
MW-16			0.4	BG				
MW-17			0.2	0.2				
TW-1			20.0	SL				
TW-2			50	SL				
RW-1			20.0	52				

Notes:

BG - Background

SL - Saturated Lamp

APPENDIX A

Correspondence

Mr. Mark Coleman Vermont Underground Storage Tank Program 193 South Main Street Waterbury, Vermont 05676 SBCollins,inc. 54 Lower Welden Street St. Albans, Vermont 054/8 802 **524-3605 · 893-7744**

RE: UST Removal - Edgewater Market St. Albans Bay, VT.

Dear Mark,

On April 1, 1991 in conjunction with your site visit to Edgewater Market, S. B. Collins, Inc. personnel excavated, purged, removed and transported the three existing 3,000 gallon UST's according to State of Vermont protocol. This letter intends to review my findings and detail my recommendations for remedial actions to prevent any environmental impact onsite or to any surrounding properties.

The project began with the removal of asphalt and subgrade road materials. No contamination was present in these gravel pack areas. The soils above and around the tanks were primarily sand backfill extending 6" to 12" beyond tank diameters. The central area around the three fill pipes showed levels of contamination between 50 and 75 ppm on our HNV meter. These soils were segregated to one side. As the tanks were exposed, the soils were monitored and piled accordingly. The maximum degree of contamination was found immediately below the western most tank at a level of 150 ppm. The soils in this area were distinctly layered silt and sand and the groundwater level corresponded with the bottom most sand level at approximately 8.5'. Bedrock was encountered at 9.5'. Some of the sand at this groundwater level was very dark grey, but P.i.D. readings were less than expected at 30-40 ppm. Native soils surrounding the tank area were stiff clay, and within 6" of the excavation wall surface, showed no contamination. At no time was any free product seen in the groundwater that accumulated in the deeper portion of the excavation.

The segregated, contaminated soils have been removed from the site to a location at S. B. Collins, Inc. headquarters, acceptable for encapsulation remediation procedures.

Mr. Mark Coleman Page 2 April 3, 1991

Further investigation was done along the shoreline, approximately 130' from the tank area. No sheen or sand discoloration was found. Since groundwater flow is in a westerly direction, further investigation of areas to the east were not conducted. Two monitor wells, installed in 1990 as part of this site's leak detection system, will be left in place to monitor groundwater contamination. They are located, as shown on the site map, to the west of the tank area.

In conclusion, the site assessment investigation has found the following:

- The backfill surrounding the tanks contained vapor phase gasoline contamination no higher than 150 ppm..
- No free product was found.
- The clay soils surrounding the tank site allowed no vapor migration.
- According to protocol, contaminated soils have been removed and are presently encapsulated offsite.
- On a timely basis, S. B. Collins, Inc. personnel will monitor the two remaining wells and will take any actions required to meet State of Vermont requirements.

If you have any questions or comments, I can be reached at S. B. Collins, Inc., 527-0116, during business hours. Thank you very much.

Sincerely yours,

S. B. COLLINS, INC.

Carl Ruprecht Purchasing

CR/meb

Enclosure

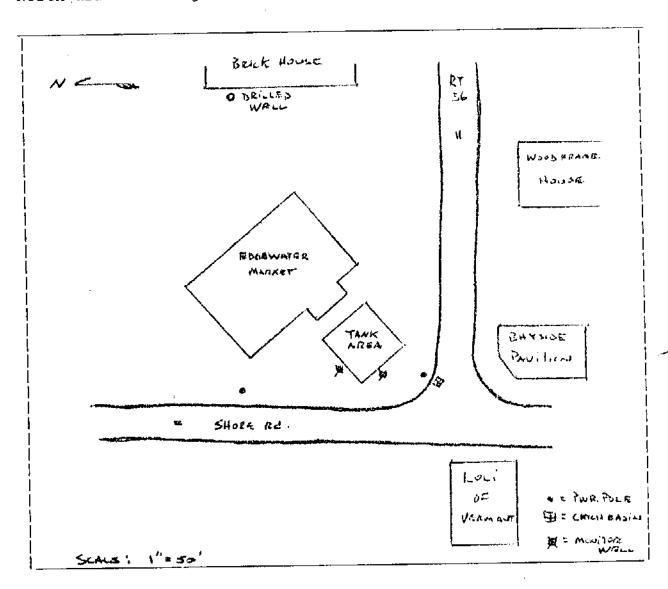
VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION UNDERGROUND STORAGE TANK PROGRAM SITE MAP

RECOMMENDED SCALE - 1" = 50 feet (but not smaller than 1" = 100 feet)

MAP DRAWN BY:

BUSINESS NAME WHERE TANK(S) LOCATED:

Show location of all tanks and property boundary; distance to permanent structures; monitoring wells; water wells within 500 foot radius; storm; sewer and water lines; sample points; areas of contamination and other pertinent site information. Indicate North arrow and major street names or route number.



White-DEC File Copy Yellow-DEC File Copy Pink-Owner Copy

ST. ALRAUS BAT

LAKE CHAM PLAND

RETURN TO:
VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION
UNDERGROUND STORAGE TANK PROGRAM
103 SOUTH MAIN STREET
WATERBURY, VERMONT 05676

DATE OF REMOVAL: 4/1/91 DATE	TE OF SITE ASSESSMENT: 4/1/91 - 4/2/91
PERSON/CO DOING SITE ASSESSMENT:	
BUSINESS NAME WHERE TANK(S) LOCATED STREET ADDRESS OF BUSINESS: TOWN/CITY:	D: Edgewater Market Route 36 St. Albams Bay, Vermont
OWNER OF TANK(S): ADDRESS OF OWNER: TOWN/CITY:	S. B. Collins, Inc. P. O. Box 571, 54 Lower Welden St. St. Albans, Vermont 05478
UST FACILITY ID#:	524-4227
TANK # PRODUCT SIZE	CONDITION
1 Gasoline 3000	Average, monor pitting, no perforation
2) 2 Gasoline 3000	Average, minor pitting, no perforation
3) 3 Basoline 3000	Average, minor pitting, no perforation
4)	
5)	
DEC PERMITTED TANKS STILL ON SITE? OUT OF SERVICE TANKS? ON PREMISES HEATING OIL TANK?	Y or M HOW MANY? Y or M HOW MANY? 1 SIZE? 275 ga
WHY IS TANK(S) BEING REMOVED? REPLACEMENTS: (Y) or N	above g HOW MANY? 2 PERMIT OBTAINED? Yes
ANY WASTE PUMPAGE: Y Or N TRANSPORTED BY:	EST. VOL.
RECEPTORS: SOILS GROUNDWATER	SURFACEWATER RESIDENTIAL
SOIL TYPE:	
CONTAMINATED SOILS:	(Y)or N AMOUNT: 30 yd <20 ppm
CONTAMINATED STOCKPILED SOILS:	Yor N AMOUNT: 20 yd 50-75 ppm
DEGREE OF CONTAMINATION: (PID READI PID CALIBRATION SCHEDULE:	INGS) Calibrated onsite 4/1/91 @ span = 8.75
MONITOR WELLS INSTALLED? Existing DEPTH TO GROUNDWATER? 90"	Yor N HOW MANY? 2
FREE PHASE PRODUCT ENCOUNTERED?	Y or N AMOUNT?
Citura	
Signature of Owner or Owner's Author	prized Representative
churz	A/3/91
Signature of Person Performing Site	Assessment Date
COMMENTS/RECOMMENDATIONS: (Please	attach on a separate page) See Attached
- t.	

White - DEC File Copy Yellow - DEC File Copy Pink - Owner Copy



State of Vermont

Department of Fish and Wildlite
Department of Forests, Parks and Recreation
Department of Environmental Consertation
State Geologist
Featural Resources Conservation Council

AGENCY OF NATURAL RESOURCES 103 South Main Street Waterbury, Vermont 05676

Department of Environmental Conservation CERTIFIED MAIL

April 16, 1991

Mr. Carl Ruprecht S.B. Collins, Inc. 54 Lower Welden St. St. Albans, VT 05478

· SUBJECT: Petroleum contamination at Edgewater Market, St. Albans

Dear Mr. Ruprecht:

On April 9, 1991, an inspector from the Department of Environmental Conservation, (DEC), was on site at the Edgewater Market, St. Albans Bay, VT to follow-up on the tank removal job conducted by S.B. Collins, Inc. on April 1, 1991.

Based on this investigation the DEC has determined the following:

- 1. S.B. Collins, Inc. was the owner of the three gasoline underground storage tanks (USTs) removed from Edgewater Market, St. Albans on April 1, 1991.
- A site assessment conducted by S.B. Collins, Inc. personnel measured petroleum contamination in the soils at levels no higher than 150 ppm.
- 3. Approximately 20 yards of petroleum contaminated soils were removed from the site to a location at S.B. Collins, Inc. headquarters for treatment by polyencapsulation.
- 4. S.B. Collins, Inc. reported no observable free product during the site assessment.
- 5. On April 9, 1991, a DEC inspector measured 2" of free product in one on-site monitoring well, and 1/8" of free product in another.
- Lake Champlain is located approximately 60 yards downgradient of the site.

The Secretary of the Agency of Natural Resources has concluded that the migration of this gasoline (which is classified as a hazardous waste) may present an imminent danger to the environment and to the people adjacent to the Edgewater Market. She has concluded that it is necessary to take appropriate action to minimize the immediate impact of such releases to the public health and the environment. Title 10

Mr. Carl Ruprecht April 16, 1991 Page 2

V.S.A. Section 1941 provides, however, that before expending state funds to do the mitigation referred to above, the Agency may provide parties who are potentially responsible for the threat to the environment with the opportunity to voluntarily perform the necessary actions under the direction of the Agency of Natural Resources.

The State hereby gives notice that it believes that S.B. Collins, Inc. is the responsible party under Title 10 V.S.A. Section 1941. The Secretary has concluded that the following actions are necessary to mitigate the situation and hereby orders S.B. Collins, Inc. to perform the following work:

- Retain the services of a qualified consultant to:
 - a. Design and implement a system to recover all free product in excess of 0.01'.
 - b. Define the degree and extent of the petroleum contamination to the soils and groundwater.
 - c. Determine what risk the contamination poses to the water quality of Lake Champlain.
 - d. Determine what other receptors are in the area which are threatened by this contamination.
 - e. Determine and implement necessary long-term monitoring and remediation activities.
 - f. Prepare and submit, not later than June 3, 1991, a report summarizing the above requested information.
- 2. Properly maintain the encapsulation surrounding the stockpiled soils. Properly dispose of these soils according to a written plan developed by the contractor and approved by DEC.
- 3. All required work will need to be approved by the DEC prior to implementation.

Please inform this office, in writing, within ten (10) days of receipt of this Notice as to whether you intend to complete the work described above voluntarily.

If you agree to do the work described above, you are requested to initiate these actions within ten (10) days of receipt of this letter. Failure to do so by this date may result in injunctive relief or in the expenditure of State funds to have this work performed.

If you decline to do so, the Secretary may move, pursuant to Title 10 V.S.A. Section 1934, to bring suit by the Vermont Attorney General's Office for injunctive relief or for the

Mr. Carl Ruprecht April 16, 1991 Page 3

imposition of penalties and fines as provided for in Title 10 V.S.A. Section 1935.

The Secretary may also move to expend State funds to have the work performed. If he does so, he will move pursuant to Title 10 V.S.A. Section 1941, to have S.B. Collins, Inc. reimburse the State of Vermont for the costs of the mitigation described above.

Sincerely,

William E. Ahearn, Director

Hazardous Materials Management Division

WEA/CS/lb1408

cc: St. Albans Town Manager

April 19, 1991

SBCollins,inc. 54 Lower Welden Street St. Albans, Vermont 05478 802 **524-3605 · 893-774**4

Mr. William E. Ahearn, Director Hazardous Materials Management Division 103 South Main Street Waterbury, VT 05676

RE: Petroleum Contamination at Edgewater Market, St. Albans, Vermont

Dear Bill:

As a follow up to your letter of April 16, 1991, I am writing with updated information collected since April 5, 1991 when remediation at Edgewater Market began. First, however, I would like to share facts that I feel directly influence the level of remediation required at this site.

On April 1, 1991, Mark Coleman and I met on site to inspect the tank pull and discuss general site assessment. We did not encounter any free product at this time, nor did I thoughout the day as the final tank was removed and the hole enlarged for new tanks.

On April 2, 1991, Ted Unkles and I met on site and discussed seemingly contaminated "dark soils" present in the excavation. We jointly determined with an HNU meter that the level of contamination was less than the "dark" appearance might indicate. We did not encounter free product or any degree of contamination associated with free product.

On April 5, I personally checked the six monitor wells immediately adjacent to the excavation (within two feet of the hole wall) and found .1' in well #3 and a trace in well #4. The other four wells were clear. I have been monitoring these six wells on a regular basis since April 5, bailing out all liquids. Since that date, this activity has successfully collected less than one gallon of extremely dark product and well numbers 3 and 4 continue to produce approximately .25' of product every other day. The other four wells have never had more than .01' of free product (three are consistently clear).

With this information in mind, I am requesting a 30 day extension to the ten day deadline for hiring a qualified consultant. During this time I will continue the collection procedures already initiated, install three more monitor wells down gradient of the tank site (see drawing attached) and prepare and submit a report as requested. Items two and three will be completed simultaneously. I am certainly willing to meet on site and discuss this plan with the DEC personnel if necessary.

Thank you very much.

Sincerely,

Carl Ruprecht

Distributor of Petroleum Products

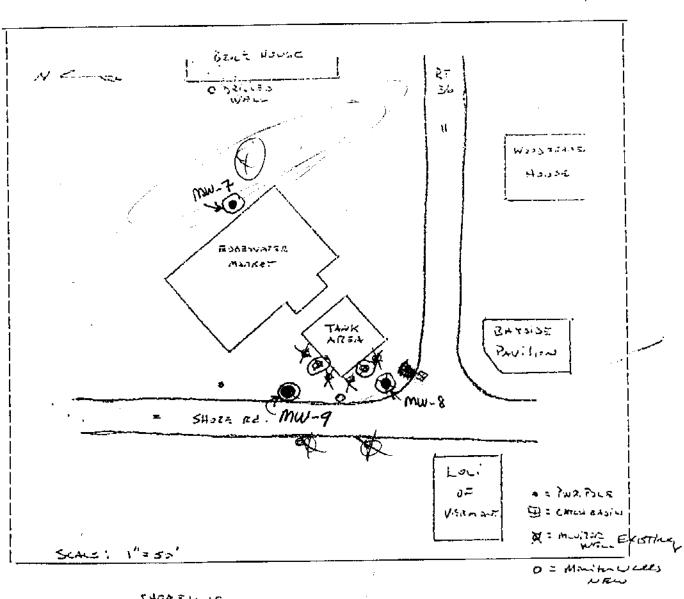
VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION UNDERGROUND STORAGE TANK PROGRAM SITE MAP

RECOMMENDED SCALE - 1" = 50 feet (but not smaller than 1" = 100 feet)

MAP DRAWN BY:

BUSINESS NAME WHERE TANK(S) LOCATED:

Show location of all tanks and property boundary; distance to permanent structures; monitoring wells; water wells within 500 foot radius; storm; sewer and water lines; sample points; areas of contamination and other pertinent site information. Indicate North arrow and major street names or route number.



ZHOVE MINE

White-DEC File Copy

Yellow-DEC File Copy

Pink-Owner Copy

ST. ALBAUS BAY

LAKE CHAMPLAIN



State of Vermont

Department of Fish and Valuation
Department of Forests, Parks and Richardion
Department of Environmental Conservation
State Carologist
Natural Resources Conservation Council

AGENCY OF NATURAL RESOURCES Department of Environmental Conservation

Hazardous Materials Division 103 South Main Street Waterbury, VT 05671-0404

CERTIFIED LETTER

May 16, 1991

Mr. Carl Ruprecht S.B. Collins, Inc. 54 Lower Welden St. St. Albans, VT 05478

RE: Petroleum Contamination at Edgewater Market, St. Albans

Dear Mr. Ruprecht:

The Hazardous Materials Management Division (HMMD) has reviewed your request to delay hiring a qualified consultant to assess the problem at Edgewater Market in St. Albans.

The HMMD will support S.B. Collins manual recovery efforts conducted to determine the approximate extent of free phase contamination. A summary of this information should be submitted to the HMMD not later than June 15, 1991.

The HMMD can not support reducing the level of effort beyond which was requested in the 1941 Demand Letter dated April 16, 1991. Despite the potential limited amount of free product in the ground, the HMMD will still require the collection of groundwater samples for laboratory analysis to determine the extent of the dissolved plume.

The HMMD is also very concerned about the potential migration of these contaminants to Lake Champlain. To determine this risk, the HMMD will require this to be investigated. This will involve determining the direction of groundwater flow, the dissolved plan configurations, and time-of-travel calculations.

The HMMD requires an expanded areal check for receptors, and the development and implementation of a long-term monitoring and remediation plan. A plan for properly treating and disposing of the soils is also needed.

I appreciate S.B. Collins position to limit costs at sites where consultant work may not be appropriate. However, the Edgewater Market site requires work that involves the expertise of a qualified consultant. Therefore, the HMMD will not support delaying the hiring of a qualified consultant for thirty days. The work is required and is not dependant upon the amount of free phase contamination.

Mr. Carl Ruprecht May 16, 1991 Page 2

Please inform this office, in writing, within five (5) days of receipt of this letter as to whether S.B. Collins intends to complete the work requested in the 1941 Demand Letter dated April 16, 1991.

Please feel free to call if you have any questions.

Sincerely,

William E. Ahearn, Director

Hazardous Materials Mgmt. Division

WEA/CS/lb1490

cc: Robert Jolly

St. Albans Town Manager

SBCollins, inc. 54 Lower Welden Street St. Albans, Vermont 05478 802 **524-3605 · 893-7744**

May 22, 1991

Mr. William E. Ahearn, Director Hazardous Materials Management 103 South Main Street Waterbury, VT 05676

RE: Minor Petroleum Contamination at Edgewater Market, St. Albans, Vermont

Dear Bill:

I will be meeting with a representative of Lincoln Applied Geology on Tuesday, May 28, 1991 to formulate a remediation plan for the above mentioned site.

Sincerely,

Carl Ruprecht

Cenaric !

CR:11g

APPENDIX B

Lincoln Applied Geology, Inc. Well Logs

EDGEWATER MARKET

WELL:

MW-7

LOCATION:

Edgewater Market, north side of building

DRILLER:

S.B. Coilins, Inc. backhoe-mounted CHAMA H.S. Augers

HYDROGEOLOGIST: Bill Norland, Lincoln Applied Geology, Inc.

DATE:

July 23, 1991

Soils Description

<u>Depth</u>	<u>Description</u>	HNU (ppm)
0'	Grass atop fill topsoil	
3.0 - 3.7'	Yellowish tan, dry, <u>silt;</u> little fine sand; trace of clay.	
3.7 - 5.0'	Greenish gray, dry, <u>fine sand;</u> little silt; trace of fine gravel and coarse sand. Oil odor.	9.8
6.0 - 8.0'	Tan, greenish gray, dry, <u>silt;</u> some fine to coarse gravel; little fine sand and clay. Faint oil odor.	3.0
> 9.5'	Bedrock refusal	
Well Construction		

Bottom of boring:

Bedrock refusal at 9.5'

Well Screen:

(6.5') 3' - 9.5', 0.020" slot, sch 40, 2" PVC

Solid Riser:

(3') 0' - 3', sch 40, 2" PVC

Sand Pack:

(8') 1.5' - 9.5'

Bentonite Seal:

(0.5') 1' - 1.5'

Backfill:

(0.5') 0.5' - 1'

Well Box:

One - flush with grade

EDGEWATER MARKET

WELL:

MW-8

LOCATION:

Edgewater Market, south of pump island

DRILLER:

S.B. Collins, Inc. backhoe-mounted CHAMA H.S. Augers

HYDROGEOLOGIST: Bill Norland, Lincoln Applied Geology, Inc.

DATE:

July 23, 1991

Soils Description

<u>Depth</u>	<u>Description</u>	(<u>MMH</u> (mqq)
0.0 - 0.3	Asphalt over crushed stone	
4.0 - 6.0'	Tan, greenish gray, dry, <u>silt;</u> some fine to coarse gravel, little clay and fine sand	0.5
7.5 - 9.5'	Tan, dark gray, wet, <u>fine to coarse</u> sand; some silt; trace of fine to coarse gravel and clay. Faint oil odor.	11.4

Well Construction

Bottom of boring:

10.01

Well Screen:

(6.5') 3.5' - 10', 0.020" slot, sch 40, 2" PVC

Solid Riser:

(3') 0.5' - 3.5', sch 40, 2" PVC

Sand Pack:

(0.5') 2' - 10' 4.5' - 2'

Bentonite Seal:

(8') 2' - 10'

Backfill:

(0.5') 1' - 1.5'

Well Box:

One - flush with grade

WELL:

MW-9

LOCATION:

Edgewater Market, north side of building

DRILLER:

S.B. Collins, Inc. backhoe-mounted CHAMA H.S. Augers

HYDROGEOLOGIST: Bill Norland, Lincoln Applied Geology, Inc.

DATE:

July 23, 1991

Soils Description

<u>Depth</u>	Description	HNU (ppm)
0.0 - 0.3'	Asphalt over crushed stone	
2.5 - 3.5'	Tan, dry, <u>silt;</u> some fine to coarse gravel; little fine sand.	
3.5 - 4.5'	Greenish gray, dry, silt; some fine sand and fine gravel; trace of coarse sand and clay.	0.5
>7.25'	Rock or bedrock refusal	
Well Construction		
Bottom of boring:	7.25'	
Well Screen:	(3.5') 3.5' - 7', 0.020" slot, sch 40, 2" PVC	
Solid Riser:	(3') 0.5' - 3.5', sch 40, 2" PVC	
Sand Pack:	(5') 2' - 7'	
Bentonite Seal:	(0.5') 1.5' - 2'	
Backfill:	(1') 0.5' - 1.5'	
Well Box:	One - flush with grade	

WELL:

MW-10 (TP-1)

LOCATION:

St. Albans Town Park, south-southwest of pump island

DRILLER:

S.B. Collins, Inc., backhoe

HYDROGEOLOGIST: Bill Norland, Lincoln Applied Geology, Inc.

DATE:

August 1, 1991

Soils Description

<u>Depth</u>	<u>Description</u>	<u>HNU</u> (ppm)
0.0 - 5.0'	Fill materials: sand, gravel, ashes, cinders, brick, plaster	
5.0 - 8.0'	Dry, <u>Fine sand</u> ; some silt and gravel; trace of clay and medium to coarse sand.	84 (6'-7')
8.0 - 9.25'+	Fractured black shale bedrock with calcite infilling. Ground water with	132 (8'-9')
	free gasoline product at 9.25'	154 (9')

Well Construction

Bottom of test pit:

9.25

Well Screen:

(5.5') 3.5' - 9', 0.020" slot, sch 40, 2" PVC

Solid Riser:

(3') 0.5' - 3.5', sch 40, 2" PVC

Sand Pack:

(7.5') 1.5' - 9'

Bentonite Seal:

(0.5') 1' - 1.5'

Backfill:

 $(0.5')\ 0.5' - 1'$

Well Box:

WELL:

MW-11 (TP-2)

LOCATION:

St. Albans Town Park, south-southwest of pump island

DRILLER:

S.B. Collins, Inc., backhoe

HYDROGEOLOGIST: Bill Norland, Lincoln Applied Geology, Inc.

DATE:

August 1, 1991

Soils Description

<u>Depth</u>	Description	HNU (ppm)
0.0 - 4.5'	Fill materials: sand, gravel, ashes, cinders, brick, plaster	
4.5 - 7.25'	Dry, Fine sand; some silt and gravel; trace of clay and medium to coarse sand.	0.6 (6'-7')
7.25 - 8.75'+	Fractured black shale bedrock with calcite infilling. Ground water with	70 (7.75-8.75')
	gasoline sheen at 9.0'	168 (8.5')

Well Construction

Bottom of test pit:

9'

Well Screen:

(5.5') 3.5' - 9', 0.020" slot, sch 40, 2" PVC

Solid Riser:

(3') 0.5' - 3.5', sch 40, 2" PVC

Sand Pack:

(7.5') 1.5' - 9'

Bentonite Seal:

 (0.5°) 1' - 1.5'

Backfill:

(0.5') 0.5' - 1'

Well Box:

WELL:

MW-12 (TP-3)

LOCATION:

St. Albans Town Park, southwest of pump island

DRILLER:

S.B. Collins, Inc., backhoe

HYDROGEOLOGIST: Bill Norland, Lincoln Applied Geology, Inc.

DATE:

August 1, 1991

Soils Description

<u>Depth</u>	<u>Description</u>	<u>HNU</u> (ppm)
0.0 - 4.5'	Fill materials: sand, gravel, ashes, cinders	
4.5 - 8.0'	Dry, Fine sand; some silt and gravel; trace of clay and medium to coarse sand.	
8.0 - 10.0'+	Fractured black shale bedrock with calcite infilling. No ground water encountered.	BG (10')

Well Construction

Bottom of test pit:

10'

Well Screen:

(6.5') 3.5' - 10', 0.020" slot, sch 40, 2" PVC

Solid Riser:

(3') 0.5' - 3.5', sch 40, 2" PVC

Sand Pack:

(8.5') 1.5' - 10'

Bentonite Seal:

(0.5') 1' - 1.5'

Backfill:

(0.5') 0.5' - 1'

Well Box:

WELL: MW-13 (TP-4)

LOCATION: St. Albans Town Park, south-southwest of pump island

DRILLER: S.B. Collins, Inc., backhoe

HYDROGEOLOGIST: Bill Norland, Lincoln Applied Geology, Inc.

DATE: August 1, 1991

Soils Description

<u>Depth</u>	Description	HNU (ppm)
0.0 - 4.5'	Fill materials: cut rock boulders (foundation), sand, gravel	
4.5 - 6.25'	Dry, <u>Fine sand</u> ; some silt and coarse gravel; trace of clay and medium to coarse sand.	118 (6'-7')
6.25 - 9.5'	Dry, fine to coarse sand; some fine to coarse gravel; little silt	138 (9-10')
9.5 - 10.0' +	Fractured black shale bedrock with calcite infilling.	194 (9.5')
	Free gasoline product >0.1' thick at 10' depth	

Well Construction

Bottom of test pit: 10.5'

Well Screen: (7') 3.5' - 10.5', 0.020" slot, sch 40, 2" PVC

Solid Riser: (3') 0.5' - 3.5',0 sch 40, 2" PVC

Sand Pack: (9') 1.5' - 10.5'

Bentonite Seal: (0.5') 1' - 1.5'

Backfill: (0.5') 0.5' - 1'

Well Box: One - flush with grade

WELL:

MW-14

LOCATION:

Edgewater Market, south-southwest of pump island

DRILLER:

Chevalier Drilling, air rotary drill rig

HYDROGEOLOGIST: Steve LaRosa, Lincoln Applied Geology, Inc.

DATE:

August 14, 1991

Soils Description

Depth

Description

HNU (ppm)

0.0 - 12.0

Dark brown pebbly medium sands. Strong

gasoline odor at 10' depth

12.0 - 30.0

Medium gray fractured shale bedrock with

calcite infilling. Soft with no obvious

large fracture zones

Well Construction

Bottom of boring:

30'

Well Screen:

(25') 5' - 30', 0.020" slot, sch 40, 2" PVC

Solid Riser:

(5') 0' - 5', sch 40, 2" PVC

Sand Pack: Bentonite Seal:

(25.5') 4.5' - 30'

(1.5') 3' - 4.5'

Backfill:

(3') 0' - 3'

Well Box:

WELL:

MW-15

LOCATION:

Edgewater Market, south-southwest of pump island

DRILLER:

Chevalier Drilling, air rotary drill rig

HYDROGEOLOGIST: Steve LaRosa, Lincoln Applied Geology, Inc.

DATE:

August 14, 1991

Soils Description

<u>D</u>epth

Description

HNU (ppm)

0.0 - 12.0

Bricks and fill, no odor of gasoline

12.0 - 30.0

Medium gray fractured shale bedrock with

calcite infilling. Soft with no obvious

large fracture zones

Well Construction

Bottom of boring:

30'

Well Screen:

(25') 5' - 30', 0.020" slot, sch 40, 2" PVC

Solid Riser:

(5') 0' - 5', sch 40, 2" PVC

Sand Pack:

(27') 3' - 30'

Bentonite Seal:

none

Backfill:

(3') 0' - 3'

Well Box:

WELL:

MW-16

LOCATION:

Edgewater Market, southwest of pump island

DRILLER:

Chevalier Drilling, air rotary drill rig

HYDROGEOLOGIST: Steve LaRosa, Lincoln Applied Geology, Inc.

DATE:

August 14, 1991

Soils Description

<u>Depth</u>	<u>Description</u>	<u>UNH</u> (mqq)
0.0 - 5.0'	Light brown medium sands	
5.0 - 30.0'	Medium gray fractured shale bedrock with calcite infilling. Soft with no obvious large fracture zones	

Well Construction

Bottom of boring:

30'

Well Screen:

(25') 5' - 30', 0.020" slot, sch 40, 2" PVC

Solid Riser:

(5') 0' - 5', sch 40, 2" PVC

Sand Pack:

(27.5') 2.5' - 30'

Bentonite Seal:

none

Backfill:

(2.5') 0' - 2.5'

Well Box:

WELL:

MW-17

LOCATION:

Northwest of USGS 109' Benchmark outside Loli of Vermont

building

DRILLER:

Chevalier Drilling, air rotary drill rig

HYDROGEOLOGIST: Steve LaRosa, Lincoln Applied Geology, Inc.

DATE:

August 14, 1991

Soils Description

Depth

Description

<u>UNH</u> <u>(ppm)</u>

0.0 - 13'

Sands and fill

13.0 - 23.0'

Medium gray fractured shale bedrock with

calcite infilling. Soft with no obvious

large fracture zones

Well Construction

Bottom of boring:

23'

Well Screen:

(18') 5' - 23', 0.020" slot, sch 40, 2" PVC

Solid Riser:

(5') 0' - 5', sch 40, 2" PVC

Sand Pack:

(18.5') 4.5' - 23'

Bentonite Seal:

none

Backfill:

(4.5') 0' - 4.5'

Well Box:

WELL:

RW-1

LOCATION:

St. Albans Town Park, south-southwest of pump island

DRILLER:

Chevalier Drilling, air rotary drill rig

HYDROGEOLOGIST: Steve LaRosa, Lincoln Applied Geology, Inc.

DATE:

August 14, 1991

Soils Description

<u>Depth</u>

Description

<u>HNU</u> (ppm)

0.0 - 8.5

Light brown medium sands, some quartzite

boulders

8.5 - 37.0'

Medium gray fractured shale bedrock with

calcite infilling. Soft with no obvious

large fracture zones

Well Construction

Bottom of boring:

37'

Well Screen:

(30.5) 6.5' - 37', 0.020" slot, continuous wound galvanized

steel

Solid Riser:

(6.5') 0' - 6.5', steel

Sand Pack:

none

Bentonite Seal:

none

Backfill:

none

Well Box:

TEST PIT:

TP-5

LOCATION:

St. Albans Town Park, south-southwest of pump island

DRILLER:

S.B. Collins, Inc., backhoe

HYDROGEOLOGIST: Bill Norland, Lincoln Applied Geology, Inc.

DATE:

August 13, 1991

<u>Depth</u>	<u>Description</u>	HNU (ppm)
0.0 - 1.0'	Tan, dry, topsoil with grass; fine sand, gravel	
1.0 - 4.5'	Buff white, dry, <u>cut and crushed limestone</u> blocks (foundation)	
4.5 - 9.0'	Tan brown to olive, moist, silt and fine sand; little fine to coarse gravel. Top of storm drain conduit 4.7' beneath grade	168 (8-9')
9.0 - 9.5' +	Fractured dark gray shale bedrock with calcite infilling. Strong gasoline odor. No ground water encountered.	
	No monitoring well installed.	

TEST PIT:

TP-6

LOCATION:

St. Albans Town Park, south-southwest of pump island

DRILLER:

S.B. Collins, Inc., backhoe

HYDROGEOLOGIST: Bill Norland, Lincoln Applied Geology, Inc.

DATE:

August 13, 1991

<u>Depth</u>	<u>Description</u>	HNU (ppm)
0.0 - 0.5'	Tan brown, dry, topsoil with grass; fine sand, gravel	
0.5 - 4.5'	White, dry, <u>crushed limestone</u> : rock fines. Top of storm drain conduit 2.75' beneath grade	
4.5 - 8.0'	Dark brown and gray, dry, fill materials: red brick, cut stone (foundation), fine to coarse sand, cinders, tree roots at 6.5' depth	
8.0 - 9.0'	Tan brown to olive, wet, <u>silt and fine sand;</u> little fine to coarse gravel. Ground water at 8.8' depth.	0.8
9.0 - 9.5' +	Fractured dark gray to black shale bedrock with calcite infilling	
	No monitoring well installed.	

TEST PIT:

TP-7

LOCATION:

St. Albans Town Park, south-southwest of pump island

DRILLER:

S.B. Collins, Inc., backhoe

HYDROGEOLOGIST: Bill Norland, Lincoln Applied Geology, Inc.

DATE:

August 13, 1991

<u>Depth</u>	Description	HNU (ppm)
0.0 - 1.25'	Tan, dry top soil with grass; fine sands gravel	
1.25 - 4.5'	Dry, boulders; (cut stone foundation); red brick, fine to coarse sand.	
4.5 - 9.5'	Tan brown and olive, dry, fine sand; some silt and fine coarse gravel.	
9.5 - 10.0' +	Fractured dark gray to black shale bedrock with calcite infilling. Slight gasoline odor. Ground water at 9.8' depth, gasoline sheen on water	164
	No monitoring well installed.	

TEST PIT:

TP-8

LOCATION:

St. Albans Town Park, south-southwest of pump island

DRILLER:

S.B. Collins, Inc., backhoe

HYDROGEOLOGIST: Bill Norland, Lincoln Applied Geology, Inc.

DATE:

August 13, 1991

<u>Depth</u>	<u>Description</u>	<u>HNU</u> (ppm)
0.0 - 0.5'	Tan brown, dry, topsoil with grass; fine sand, and fine to coarse gravel	
0.5 - 5.0'	Dry, <u>boulders</u> ; (cut stone foundation) red brick, sand.	
5.0 - 8.0'	Tan brown and olive, dry, <u>fine sand;</u> some silt and fine to coarse gravel.	
8.0 - 8.25'+	Fractured dark gray to black shale bedrock with calcite infilling. Slight gasoline odor. No ground water encountered.	142
,	No monitoring well installed.	

APPENDIX C

Chemical Ground Water Quality Results



32 James Brown Drive Williston, Vermont 05495 (802) 879-4333 FAX 879-7103

LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: Lincoln Applied Geology PROJECT NAME: Edgewater St. Albans

REPORT DATE: August 22, 1991 ANALYSIS DATE: August 13, 1991

SAMPLER: James STATION: MW - 5 DATE SAMPLED: August 6, 1991 REF.#: 22,391

DATE RECEIVED: August 6, 1991 TIME SAMPLED: 12:05

<u>Parameter</u>	<u>Concentration (</u>	(<u>ug/L)</u>
Benzene	7,410.	
Toluene	21,600.	
Ethylbenzene	2,380.	S 60 62 0 11
Xylenes	17,400.	1 5 5 5
MTBE	3,830.	4. 4.16 9 (4.5)
		A PLIED GEOLGE

NUMBER OF UNIDENTIFIED PEAKS FOUND: 19

Reviewed by Suzanu Flendoll ____



32 James Brown Drive Williston, Vermont 05495 (802) 879-4333 FAX 879-7103

LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: Lincoln Applied Geology PROJECT NAME: Edgewater St. Albans

ANALYSIS DATE: August 13, 1991 REPORT DATE: August 22, 1991

STATION: MW-7 SAMPLER: James DATE SAMPLED: August 6, 1991 REF.#: 22,390

DATE RECEIVED: August 6, 1991 TIME SAMPLED: 12:00

Concentration (uq/L) Parameter

 ND^{1} Benzene Toluene 6.78 Ethylbenzene ND Xylenes ND NĐ

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0 COLN APPLIED GEOLOGY, INC

NOTES:

MTBE

Compound not detected in analysis

Reviewed by Sugar Fundell



32 James Brown Drive Williston, Vermont 05495 (802) 879-4333 FAX 879-7103

LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: Lincoln Applied Geology PROJECT NAME: Edgewater St. Albans

REPORT DATE: August 22, 1991 ANALYSIS DATE: August 13, 1991

SAMPLER: James

STATION: MW - 8

DATE SAMPLED: August 6, 1991 REF.#: 22,392A

DATE RECEIVED: August 6, 1991 TIME SAMPLED: 12:10

Concentration (uq/L) <u>Parameter</u>

Benzene	44.1
Toluene	25.5
Ethylbenzene	ND 1
Xylenes	75.6
MTBE	133.

NUMBER OF UNIDENTIFIED PEAKS FOUND:

NOTES:

1 Compound not detected in analysis

Reviewed by Serann Therson



32 James Brown Drive Williston, Vermont 05495 (802) 879-4333 FAX 879-7103

LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: Lincoln Applied Geology PROJECT NAME: Edgewater St.Albans

REPORT DATE: August 22, 1991 ANALYSIS DATE: August 13, 1991

STATION: Bailer Blank SAMPLER: James

DATE SAMPLED: August 6, 1991 REF.#: 22,392B

DATE RECEIVED: August 6, 1991 TIME SAMPLED: 12:15

Concentration (uq/L) Parameter

 N_D 1 Benzene ND Toluene Ethylbenzene ND ND Xylenes MTBE ND

NUMBER OF UNIDENTIFIED PEAKS FOUND:

COLN APPLIED GEO! OG and the second section of the s

NOTES:

Compound not detected in analysis

Reviewed by Susan Denjoy



32 James Brown Drive Williston, Vermont 05495 (802) 879-4333 FAX 879-7103

LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: Lincoln Applied Geology PROJECT NAME: Edgewater St.Albans

REPORT DATE: August 22, 1991 ANALYSIS DATE: August 13, 1991

SAMPLER: James STATION: Trip Blank

DATE SAMPLED: August 6, 1991 REF.#: 22,392C

DATE RECEIVED: August 6, 1991 TIME SAMPLED: 12:16

Parameter Concentration (ug/L)

Benzene	ND 1	
Toluene	ND	and the second party of the second party and the second party of t
Ethylbenzene	ND	(a) E G B I W 1
Xylenes	ИД	AUG ((S))
MTBE	ND	
		ROOLN APPLIED GEOLOGY, INC

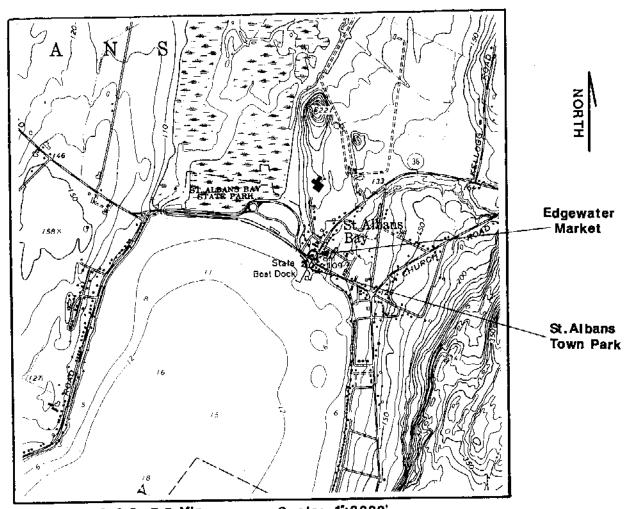
NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:

1 Compound not detected in analysis

Reviewed by Sugar Gendel

GENERAL LOCATION MAP



Source: U.S.G.S. 7.5 Min. Topo. Series

St.Albans Bay Quad

Scale: 1':2000'

Apartments Edgewater Market Bayside Pavillon Apartments : Dock Loll of Vermont Rushford **LEGEND** Water Well Source: U.S.G.S. 7.5 Mln. Topo. Series St. Albana Bay Quad

Scale: 1' = 250'